

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ :	A1	(11) International Publication Number:	WO 99/33124
H01M 2/10		(43) International Publication Date:	1 July 1999 (01.07.99)
(21) International Application Number:	(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).		
(22) International Filing Date:	22 December 1998 (22.12.98)		
(30) Priority Data:	(21) International Application Number: PCT/SE98/02415 (22) International Filing Date: 22 December 1998 (22.12.98) (30) Priority Data: 9704855-7 23 December 1997 (23.12.97) SE (71) Applicant: TELEFONAKTIEBOLAGET LM ERICSSON [SE/SE]; S-126 25 Stockholm (SE). (72) Inventor: WOLF, Mats, Erik; Valdemars väg 124, S-224 74 Lund (SE). (74) Agents: STRÖM, Tore et al.; Ström & Gulliksson AB, P.O. Box 4188, S-203 13 Malmö (SE).		
(54) Title:	A PORTABLE ELECTRONIC APPARATUS, WITH BATTERY SUPPLIED COMPONENTS		
(57) Abstract	<p>A portable electronic apparatus, comprising a plurality of battery supplied components (3, 6; 10, 12, 14, 16, 18, 20) of which at least two require different supply voltages or currents. Several individual batteries (2, 4, 7; 9, 13, 15, 17, 19) are respectively adapted for the power supply of a particular component, located in a cavity, and integrated with the respective apparatus (1; 8).</p>		
<p>The diagram illustrates a portable electronic device, likely a mobile phone. It features a rectangular housing (1) with a flip-top cover. A vertical slot (4) on the side provides access to an internal cavity where a component (3) is housed. A battery (2) is shown being inserted into this slot. Other labeled parts include (5, 6, 7, 8) which represent various other components and connectors within the device.</p>			

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

TITLE: A PORTABLE ELECTRONIC APPARATUS,
WITH BATTERY SUPPLIED COMPONENTS

5

Field of the Invention

The present invention relates to portable electronic apparatuses and particularly to electronic apparatuses
10 comprising a plurality of battery supplied components, wherein at least two components require different amounts supply voltages or currents.

Description of the Prior Art

15 Battery supplied electronic equipment utilizes, for example, rechargeable batteries in a single power source, a battery pack powering the different components of the equipment. Conventionally, the battery pack is replaceable, since the cells in general have shorter lifetime than the
20 equipment itself. The battery pack concept suffers from some obvious disadvantages, for example that the battery is a separate component and can not easily be integrated with the equipment in any efficient way. Further, a single battery supply of a device with several different power
25 consuming functions and components having different electric requirements, in terms of voltage and current, requires transformations, with necessity resulting in power losses, and additional contact resistance is introduced between the battery pack and the present device.

30 Rechargeable batteries used for electronic equipment consist of an electrochemically reactive couple separated by an ion transport medium or electrolyte. Such batteries utilize a liquid electrolyte, requiring a can for its storage. Further, the can is used for maintaining an
35 intimate contact between the different layers in the cell (anode/sePARATOR/cathode).

However, the availability of solids capable of being fabricated into electronically insulating elements with fairly low overall ionic resistance has stimulated the development of solid electrolyte batteries. Several of 5 these types of batteries are commercially available and are important power sources at normal temperatures in, for example, volatile computer memories and other low power applications requiring long shelf and service life. New 10 battery developments include cells with solid state, gel or hybrid polymer electrolytes. There are no free liquid electrolytes in such cells. Further, the internal structure of such cells is maintained by the polymer. Thus, there is no need for a can for the cell construction.

The cells are typically based on lithium (Li) or Li- 15 ion technology. Lithium as an anode material has several advantages. It has a high specific capacity on both the weight and the volume basis. Further, it is strongly electro-positive, leading to high voltage when coupled with typical cathode materials. Suitable lithium ion conductors 20 are available for use as solid electrolytes.

Additional advantages of polymer electrolyte cells over liquid electrolyte cells with fluid electrode components, are their low rates of self-discharge, the ability to operate over a wide range of environmental 25 conditions, and high energy densities. Further these constructions are flexible in design, fabricated as thin cells and generally preferred from a performance perspective.

US-A-5 124 508 discloses an invention using sheet 30 battery material as a circuit board substrate to eliminate the weight and bulk of batteries as separate circuit components and also to eliminate the weight and bulk of fiberglass substrate or flex substrate as printed circuit materials. It is an object of the invention to consolidate 35 electronic circuitry by mounting the circuitry on the

neutral insulating covering of sheet battery material on one or both sides of a battery unit.

Printed circuit and surface mounting techniques and evaporate circuit techniques are used on both fibre board and flex circuit films. Further, it is an object of the invention to allow ease of assembly and in field replacement of the battery unit for circuit structure independent of the battery unit.

According to an invention disclosed by WO92/19090 it is proposed to provide a circuit board with an electrical power supply comprising a cell formed integrally in the circuit board. By forming the cell integrally in the circuit board it is possible to eliminate the requirement for a separate casing, since in fact the circuit board performs that function. Similarly as for US-A-5 124 508 this invention is designed for use with circuit boards.

Summary of the Invention

The present invention provides portable electronic apparatuses, comprising a plurality of battery supplied components, wherein new battery cell technology is utilised to make the most effective use of the cell energy and most efficient use of the space in the particular apparatus.

This is accomplished by using several individual batteries, each battery being adapted for the power supply of a particular device, located in a cavity and integrated with the respective device.

A particular object of the invention is to supply various components of, for example, a portable computer using one battery for each component, such as a display, a PCB, a harddisk, a CD-ROM drive etc.

Still another object of the invention is to provide for power supply for different components of, for example, a mobile telephone. Such components are a logic part, a radio part, and a display.

An aspect of this invention is that said batteries include solid state, gel or hybrid polymer electrolytes.

Thus, the present invention discloses an arrangement for portable electronic apparatuses provided with thin film 5 battery cells, wherein the use of this new technology benefits from making the electronic equipment both energy effective and more space efficient.

Brief Description of the Drawings

10 In order to explain the invention in more detail and the advantages and features of the invention a preferred embodiment will be described in detail below, reference being made to the accompanying drawings, in which

15 FIG 1 is a front view of a portable computer provided with batteries according to the invention;

FIG 2 is a side view of the computer in FIG 1;

FIG 3 is a mobile telephone apparatus provided with batteries according to the invention; and

20 FIG 4 is a side view of the mobile telephone apparatus in FIG 3.

Detailed Description of the Invention

The present invention discloses an arrangement for 25 portable electronic apparatuses comprising a plurality of battery supplied components, wherein several components require different supply voltages or currents.

In order to feed the different parts of an electronic device, batteries are integrated in the device and different batteries are adapted to achieve the required 30 capacity, such as voltage, for the supply of a particular function or component of the device. The batteries are integrated in the device and have a shape suitable to fit into cavities and to engage with surfaces within the device.

FIG 1 and FIG 2 show a portable computer 1, such as a laptop or notebook computer provided with the batteries according to the invention. A first battery 2 is arranged on a surface behind a display 3 of the computer 1. A second 5 battery 4 is arranged on the inside of a casing 5 of the computer 1. A PCB 6 inside the casing 5 is provided with a third battery 7. In this embodiment of an electronic apparatus in the form of a portable computer 1, both the first battery 2 and the third battery 7 have a plane 10 rectangular area. However, the second battery 4 has a shape sufficiently adapted to the interior shape of the casing 5.

As mentioned above different kinds of electronic devices and apparatuses can be provided with battery arrangements according to the invention. FIGs 3 and 4 show 15 a mobile telephone apparatus 8 provided with a set of batteries according to the invention. A low capacity battery 9 with a voltage of for example 2-3 V is used. The battery 9 is arranged on a PCB 10 in this embodiment. Further a radio part, not shown on the drawings, is provided with a high capacity battery with a voltage of for 20 example 5-6 V. Even this battery may be attached to the PCB 10. A second low capacity battery 11 of for example 6-12 V is attached to a display 12 of the telephone apparatus 8. Additionally a keypad battery 13 is attached to the keypad 25 14, a loudspeaker battery 15 is attached for the supply of a loudspeaker 16, a microphone battery 17 is attached to a microphone 18, and finally an indicator battery 19 is connected to a light indicator 20.

As electrochemical system Li or Li-ion technology is 30 used for batteries according to the present invention. Further, the batteries are of polymer type, utilizing a solid state, gel or hybrid polymer electrolyte. Such cells can be constructed in many different ways with several choices of active materials in the anode and cathode. The 35 use of the polymer electrolyte concept makes the cell self-

supporting and eliminates or traps free liquid electrolytes, if it is used in the cell. Consequently, this enables production of cells in almost any shape, wherein the cells are formed from thin cell components. A preferred 5 form of the present invention is thin cells, but not necessarily flat cells.

To some extent specific electrical features can be obtained through this technology by choosing the active electrode material in order to achieve a specific voltage 10 profile and/or connecting cells in series. Another controllable basic performance feature is the capacity, governed by active material content in the cell.

It should be apparent that the present invention provides an improved battery arrangement for the power 15 supply of the different power consuming components in an electronic apparatus, wherein several batteries are integrated in the apparatus for the supply of particular functions or components. Each battery has suitable electrical features such as voltage and capacity for the 20 current supplied function. According to the described embodiments the apparatuses are provided with battery arrangement having shapes governed by the shape of the present apparatus, wherein cavities and surfaces within the apparatus are used for the location of the batteries.

The invention has been described considering specific 25 embodiments thereof, but this is just intended to be an exemplification of the invention concept and is not intended to limit the invention to the specific embodiments described. In other embodiments of the invention such 30 battery arrangements can be adapted for the components of, for example, a PDA (Personal Digital Assistant), an organizer, a handheld tape-recorder, or CD-player etc.

CLAIMS

1. A portable electronic apparatus, comprising a plurality of battery supplied components (3,6;10,12,14, 16,18,20) of which at least two require different supply voltages or currents, characterized by several individual batteries (2,4,7;9,13,15,17,19) integrated with the respective apparatus (1;8), each battery being adapted for the power supply of a particular component, and having a shape suitable to fit into cavities and to engage with a surface of the respective component.
2. A portable electronic apparatus according to claim 1, characterized in that a portable computer (1) has a first battery cell (2) attached to a display (3), a second battery cell (4) attached to an inner surface of a casing (5) of the computer (1), and a third battery cell (7) attached to a PCB (6) (FIG 2).
3. A portable electronic apparatus according to claim 1, characterized in that a mobile telephone apparatus (8) comprising a logic part, a radio part, and a display (16) has a low-capacity battery cell (9) attached to the logic part (10), a high-capacity battery cell attached to the radio part, and a low-capacity battery cell (15) attached to the display (16) (FIG 4).
4. A portable electronic apparatus according to claim 3, characterized by a keypad battery (13) attached to a keypad (14), a loudspeaker battery (15) attached to a loudspeaker (16), a microphone battery (17) attached to a microphone (18), and an indicator battery (19) connected to a light indicator (20).
5. A portable electronic apparatus according to any of the preceding claims, characterized in that

said batteries include solid-state, gel or hybrid polymer electrolytes.

6. Use of new battery cell technology according to
5 claim 5 in a portable electronic apparatus, comprising a plurality of battery supplied components (3,6;10,12,14, 16,18,20) of which at least two requires different supply voltages or currents, characterized by the use of several individual batteries integrated with the
10 respective apparatus (1;8), each battery being adapted for the power supply of a particular component, and having a shape suitable to fit into cavities and to engage with a surface of the respective component in order to make the most effective use of the cell energy and most efficient
15 use of the space in the particular apparatus (1;8).

7. Use according to claim 6,
characterized by the use of a first battery cell (2) attached to a display (3) of a portable computer
20 (1), a second battery cell (4) attached to an inner surface of a casing (5) of the computer (1), and a third battery cell (7) attached to a PCB (6) (FIG 2).

8. Use according to claim 6,
25 characterized by the use of a low-capacity battery cell (9) attached to a logic part (10), a high-capacity battery cell attached to a radio part, and a low-capacity battery cell (15) attached to a display (16) of a mobile telephone apparatus (8) (FIG 4).

30

9. Use according to claim 7 or 8,
characterized by the use of a keypad battery (13) attached to a keypad (14), a loudspeaker battery (15) attached to a loudspeaker (16), a microphone battery (17)

attached to a microphone (18), and an indicator battery (19) connected to a light indicator (20).

1/2

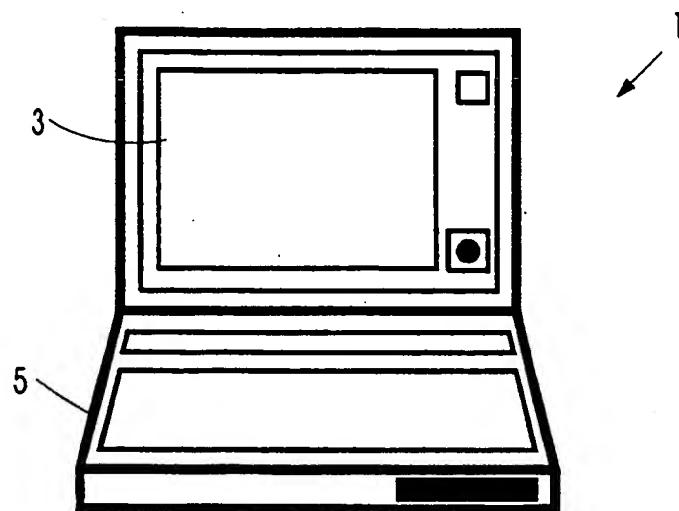


FIG. 1

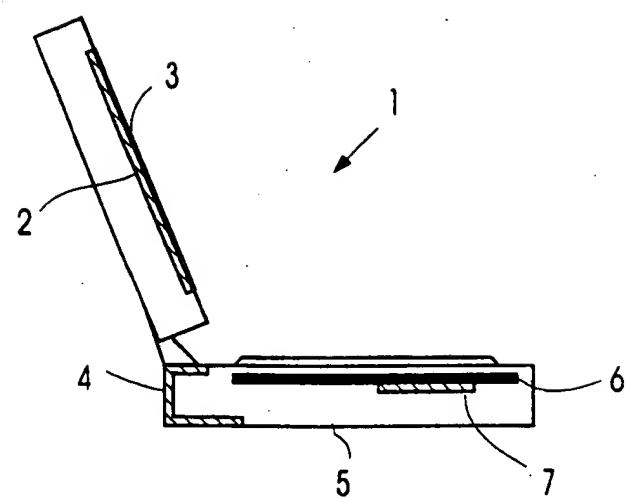


FIG. 2

2/2

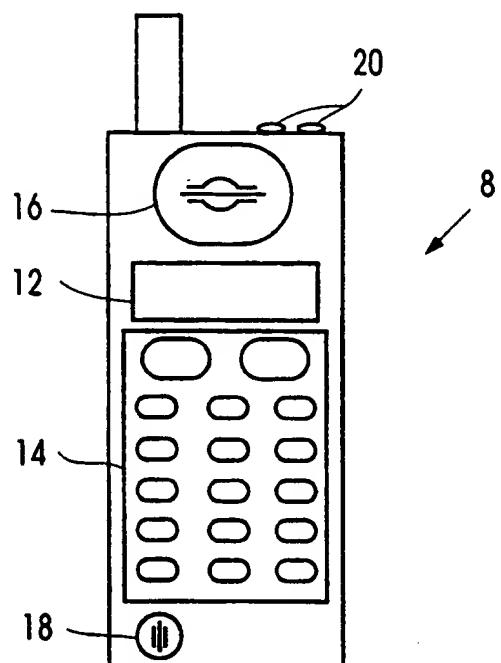


FIG. 3

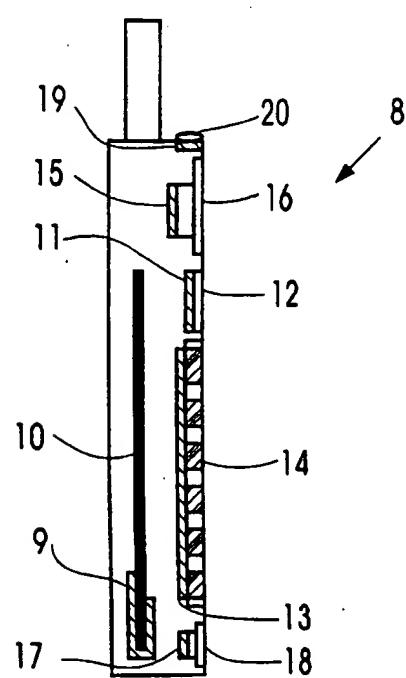


FIG. 4

INTERNATIONAL SEARCH REPORT

1

International application No.

PCT/SE 98/02415

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H01M 2/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H01M, H04M, H02J, G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5485073 A (MASAHICO KASASHIMA ET AL), 16 January 1996 (16.01.96), column 3, line 63 - column 5, line 23 --	1-4
X	US 5658685 A (MANUEL OLIVER), 19 August 1997 (19.08.97), column 1, line 10 - column 2, line 15 --	1,5-9
A	US 5124508 A (DENYSE DUBRUCQ), 23 June 1992 (23.06.92), column 1, line 5 - line 24; column 5, line 15 - line 21 -- -----	1-9

 Further documents are listed in the continuation of Box C. See patent family annex.

- * Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

30 March 1999

Date of mailing of the international search report

15-04-1999

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Ulla Granlund
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/SE 98/02415

Patent document cited in search report	Publication date		Patent family member(s)	Publication date
US 5485073 A	16/01/96		EP 0435317 A JP 3203525 A JP 4054617 A JP 4055924 A	03/07/91 05/09/91 21/02/92 24/02/92
US 5658685 A	19/08/97		EP 0846346 A US 5639573 A WO 9708765 A	10/06/98 17/06/97 06/03/97
US 5124508 A	23/06/92		US 5147985 A	15/09/92